

A taxonomic study of the subfamily Conophyminae (Orthoptera: Caelifera: Acridoidea) from Eurasia

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Abstract: This paper describes 3 new tribes (Bienkoini tribe nov., Genimenini tribe nov. and Plotnikovini tribe nov.) and a new genus (*Eozubovskya* gen. nov.) of the subfamily Conophyminae, and provides a key to the tribes and genera of the subfamily from Eurasia. Three genera *Khayyamia* Koçak, 1981, *Conophymacris* Willemse, 1933 and *Zagrosia* Descamps, 1967 are moved to the subfamily Podisminae based on the presence of the wings.

Key words: Orthoptera; Conophyminae; taxonomy; new tribe; new genus; Eurasia.

The Conophyminae is a small group in Acridoidea, distributed in mountainous region and plateau. The main diagnostic features of Conophyminae include antennae filiform, fastigial furrow absent, prosternum between fore legs with a distinct elongate process, tegmina and wings in both sexes lacking, upper basal lobe of hind femur longer than the lower one and upper carinula of hind femur smooth, not serrated (Plate I: A, B).

The Conophyminae is rather poorly studied, especially with regard to systematics. The first species of the subfamily, *i. e.*, *Italopodisma costai* (Targioni-Tozzetti), was described in 1881, and the first two genera of the group, *i. e.*, *Conophyma* and *Tarbaleus*, were established by Zubowsky in 1898. Mistshenko (1952) established tribe Conophymini based on type genus *Conophyma*. According to morphological character, Dirsh (1975) established subfamily Conophyminae on the basis of morphology and this treatment was adopted by Yin (1982) using the subfamily in his taxonomic system. However, it is controversial about the taxonomic status of Conophyminae, which had been placed in Hemiacrididea (Dirsh, 1975), Oedipodidae (Yin, 1982), Dericorythidae (Eades, 2000; Eades *et al.*, 2009), and Catantopidae (Li *et al.*, 2006).

The present study on systematics of Eurasian Conophyminae is based on a comprehensive survey of the published work of many experts and detailed comparative study of specimens of the subfamily from China deposited in the Museum of Hebei University (16

species in 9 genera), and photos of type specimens retrieved from <http://www.biologie.uni-ulm.de/syntax> (44 species in 15 genera). We conclude that Conophyminae belongs to Catantopidae, Acridoidea for upper basal lobe of hind femur longer than lower one (the upper basal lobe of hind femur is equal to the lower one in the Dericorythidae). In addition, we also consider that the three genera *Khayyamia* Koçak, 1981, *Conophymacris* Willemse, 1933 and *Zagrosia* Descamps, 1967 that were placed in Conophyminae in the Online Orthoptera Species File (Eades *et al.*, 2009) do not belong to Conophyminae because of the presence of wings (Conophyminae are wingless) and should be transferred to Podisminae for with highly reduced wings. Furthermore, we agree with Li *et al.* (2006) that the genus *Conophymacris* Willemse, 1933 is a member of the subfamily Podisminae.

According to the classification scheme suggested in the present study, the subfamily Conophyminae in Eurasia comprises a total of 25 genera, including 1 new genus, and 189 species (Bolivar, 1817; Brunner von Wattenwyl, 1898; Zubowsky, 1898; Umnov, 1930; Dovnar-Zapolskii, 1933; Uvarov, 1933; Uvarov, 1942; Mishchenko, 1950; Bei-Bienko & Mishchenko, 1951 [1963]; Ramme, 1951; Mishchenko, 1952 [1965]; Willemse, 1955 [1956]; Willemse, 1972; Harz, 1973; Harz, 1975; Yin *et al.*, 1979; Storozhenko, 1980; Huang, 1983; Huang, 1984; Willemse, 1984; Yin, 1984; Yin *et al.*, 1996; Zheng and Shi, 1998; Li *et al.*, 2006; Yin and Li, 2006; Eades *et al.*, 2009). Yin (1990) suggested two

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important characters in grasshopper taxonomy, *i. e.*, (1) the presence / absence of distinct external apical spine on hind tibia and (2) the presence / absence of distinct tympanum on the first abdominal tergite. Based on these two characters, we propose that the subfamily

Conophyminae from Eurasia is further divided into 4 tribes: Bienkoini tribe nov., Conophymini, Genimenini tribe nov. and Plotnikovini tribe nov. A key to tribes and genera of the Conophyminae from Eurasia is provided below.

Key to tribes and genera of the subfamily Conophyminae from Eurasia

- 1(10) Hind tibia with distinct external apical spine (Plate I : E).
- 2(5) First abdominal tergite with distinct tympanum. **I. Tribe Bienkoini nov.**
- 3(4) Pronotum without longitudinal carina **1. *Tarbaleus* Brunner von Wattenwyl, 1898**
- 4(3) Pronotum with distinct longitudinal carina. **2. *Bienkoa* Mishchenko, 1950**
- 5(2) First abdominal tergite without tympanum (Plate I : D). **II. Tribe Conophymini**
- 6(7) Mid-femora in ♂ very strongly thickened **3. *Tarbinskia* Mishchenko, 1950**
- 7(6) Mid-femora in ♂ slightly or not thickened.
- 8(9) Anterior margin of fastigium nearly rounded, without emargination in the middle. Prosternal process conical. Cerci of male narrow and long, distinctly compressed. Posterior margin of the 10th abdominal tergite in male with triangular furcula. **4. *Conophyma* Zubovski, 1898**
- 9(8) Anterior margin of fastigium slightly narrow, with distinct emargination. Prosternal process collar-like or triangular, its margin lip-like or tongue-like. Cerci in male conical. Posterior margin of the 10th abdominal tergite in male with transverse plate-like furcula **5. *Conophymopsis* Huang, 1983**
- 10(1) Hind tibia without external apical spine (Plate I : A2).
- 11(36) First abdominal tergite with distinct tympanum (Plate I : A1, C) **III. Tribe Genimenini nov.**
- 12(33) Pronotum without lateral carinae (Plate I : A3).
- 13(14) Metazona of pronotum distinctly enlarged and elevated on dorsum, higher than that in prozona. Distance between eyes 3 times as long as the width between basal segments of antennae. **6. *Gibbitergum* Zheng & Shi, 1998**
- 14(13) Pronotum straight and flat on dorsum, metazona of pronotum not enlarged and elevated.
- 15(16) Prozona of pronotum longer, its length about 4 or more times as long as metazona. Lateral lobes of metasternum connecting each other on the posterior portion **7. *Genimen* Bolivar, 1917**
- 16(15) Prozona of pronotum shorter, its length about 2 – 3 times as long as metazona (Plate I : A3, F).
- 17(22) Opening of the tympanum 3 or more times as wide as the spiracle before it.
- 18(21) ♂ cerci not conical (Plate I : I, J), ♀ subgenital plate only triangularly projecting in the middle of the hind margin.
- 19(20) ♂ cerci (seen in profile) as in Plate I (I); ovipositor as in Plate I (K); ♀ epiproct mostly with small dark spots laterally **8. *Micropodisma* Dovnar-Zapolskii, 1933**
- 20(19) ♂ cerci (seen in profile) as in Plate I (J); ovipositor as in Plate I (L); ♀ epiproct without small dark spots; **9. *Pseudoprumna* Dovnar-Zapolskii, 1933**
- 21(18) ♂ cerci conical, hind margin of the subgenital plate in ♀ slightly three-lobed. Metazona slightly wrinkled **10. *Peripodisma* Willemse, 1972**
- 22(17) Opening of the tympanum not more three times as wide as the spiracle before it, most only once to twice as wide as the spiracle before it.
- 23(28) Pronotum with distinct and lower middle carinae.
- 24(27) Frontal ridge not projected out between antennae (Plate I : A, B)
- 25(26) Tympanum very small, hardly visible (Plate I : A1). Tenth tergite with distinct furculae in male. Mesosternal interspace squarish **11. *Eozubovskya* gen. nov.**
- 26(25) Tympanum developed, very large (Plate I : C). Tenth tergite without furculae in male. Mesosternal interspace not squarish **12. *Guizhouacris* Yin & Li, 2006**
- 27(24) Frontal ridge projected out between antennae (Plate I : H) **13. *Rhinopodisma* Mishchenko, 1954**
- 28(23) Pronotum without median carina, or only with trace of median carina.
- 29(30) Furcula short, wide. Ovipositor with denticulated transversal ridge basally. Subgenital plate in ♀ pointed triangularly projecting in the middle of the hind margin **14. *Epipodisma* Ramme, 1951**
- 30(29) Furcula longer, if short, then more slender; Ovipositor without denticulated transversal ridge basally.
- 31(32) ♂ epiproct with one tubercle in each side in the apical half (Plate I : N); epiphallus with single lophi; ♀ subgenital plate with a triangular projection in the middle of the hind margin **15. *Italopodisma* Harz, 1973**
- 32(31) ♂ epiproct with two tubercles in the apical half (Plate I : M); lophi of the epiphallus with two humps; ♀ subgenital plate with three-lobed hind margin **16. *Cophopodisma* Dovnar-Zapolskii, 1933**
- 33(12) Pronotum with distinct lateral carinae, sometimes weaker, incomplete.
- 34(35) Lateral carinae of pronotum weaker, incomplete (Plate I : G) **17. *Qinlingacris* Yin & Chou, 1979**
- 35(34) Lateral carinae of pronotum distinct, intact throughout **18. *Eokingdonella* Yin, 1984**
- 36(11) Tympanum absent **IV. Tribe Plotnikovini nov.**
- 37(46) Vertical diameter of eye in both sexes strongly larger, equal to or larger than length of subocular groove.

- 38(45) Pronotum without lateral carinae.
 39(42) Median carinae low and thin, throughout pronotum.
 40(41) Antennae in both sexes longer, extending far beyond poster margin of pronotum, arrived or not arrived the base of hind femora. Anterior margin of fastigium intact in dorsal view, without emargination. Posterior margin of pronotum intact or slightly concaved. Ovipositor valves of female with 2 teeth at apex. **19. Zubovskya Dovernar-Zapolskii, 1933**
 41(40) Antennae in both sexes shorter, extending to or slightly beyond poster margin of pronotum. Anterior margin of fastigium with intact emargination in dorsal view. Posterior margin of pronotum widely concaved. Ovipositor valves of female not split into 2 teeth at apex **20. Anepipodisma Huang, 1984**
 42(39) Pronotum without median carina, or median carina only in metazona.
 43(44) Ratio width of the vertex between the eyes: length of the eyes in ♂ as 2:7–8, in ♀ as 2:4.3–6; postfemora three times as long as high; ♀ subgenital plate with a slight longitudinal furrow in the middle which is bordered with longitudinal callosities or toothed ridges laterally (Plate I : O) **21. Oropodisma Uvarov, 1942**
 44(43) Ratio width of vertex between the eyes: length of the eyes in ♂ as 2:4.2(5, in ♀ as 2:2.7–3.3; postfemora three and a half to four times as long as high; ♀ subgenital plate without a longitudinal furrow in the middle apically **22. Chortopodisma Ramme, 1951**
 45(38) Lateral carinae of pronotum distinct, intact throughout (Plate I : F) **23. Kingdonella Uvarov, 1933**
 46(37) Vertical diameter of eye in both sexes significantly less than subocular groove.
 47(48) Mesosternum with a very wide inter-lobal space in both sexes, its narrowest part in ♂ 3 times, in ♀ 4 times greater than its length **24. Plotnikovia Umnov, 1930**
 48(47) Mesosternum with a wider inter-lobal space, its narrowest part in ♂ 1.5 times, in ♀ 3 times greater than its length **25. Pachypodisma Dovernar-Zapolskii, 1933**

Tribe Bienkoini nov.

Body small, medium or large sized. Antennae filiform, fastigial furrow absent. Prosternum between fore legs with a distinct elongate process. Tegmina and wings in both sexes lacking. Upper basal lobe of hind femur longer than lower one and upper carinula of hind femur smooth, not serrated. Hind tibia with distinct external apical spine. First abdominal tergite with distinct tympanum.

Type genus: *Bienkoa* Mishchenko, 1950

Two genera of this new tribe are known in Eurasia: *Tarbaleus* Brunner von Wattenwyl, 1898 and *Bienkoa* Mishchenko, 1950.

The tympanum of *Tarbaleus* Brunner von Wattenwyl, 1898 is unknown. If tympanum is absent, then the genus belongs to the tribe Conophymini.

Tribe Genimenini nov.

Body small to medium sized. Antennae filiform, fastigial furrow absent. Prosternum between fore legs with a distinct elongate process. Tegmina and wings in both sexes lacking. Upper basal lobe of hind femur longer than lower one and upper carinula of hind femur smooth, not serrated. Hind tibia without external apical spine. First abdominal tergite with distinct tympanum.

Type genus: *Genimen* Bolivar, 1917

Thirteen genera of this new tribe are known in Eurasia: *Gibbitergum* Zheng & Shi, 1998; *Genimen* Bolivar, 1918; *Micropodisma* Dovernar-Zapolskii, 1933; *Pseudoprugna* Dovernar-Zapolskii, 1933; *Peripodisma* Willemse, 1972; *Eozubovskya* gen. nov.; *Guizhouacris* Yin & Li, 2006; *Rhinopodisma* Mishchenko, 1954; *Epipodisma* Ramme, 1951; *Italopodisma* Harz, 1973; *Cophopodisma* Dovernar-Zapolskii, 1933; *Qinlingacris*

Yin & Chou, 1979 and *Eokingdonella* Yin, 1984.

Tribe Plotnikovini nov.

Body small to medium sized. Antennae filiform, fastigial furrow absent. Prosternum between fore legs with a distinct elongate process. Tegmina and wings in both sexes lacking. Upper basal lobe of hind femur longer than lower one and upper carinula of hind femur smooth, not serrated. Hind tibia without external apical spine. Tympanum absent.

Type genus: *Plotnikovia* Umnov, 1930

Seven genera of this new tribe are known in Eurasia: *Zubovskya* Dovernar-Zapolskii, 1933; *Anepipodisma* Huang, 1984; *Oropodisma* Uvarov, 1942; *Chortopodisma* Ramme, 1951; *Kingdonella* Uvarov, 1933; *Plotnikovia* Umnov, 1930 and *Pachypodisma* Dovernar-Zapolskii, 1933.

Eozubovskya gen. nov. (Plate I : A, B)

Body small to middle in size. Head large and short, shorter than length of pronotum. Antennae filiform, in both sexes long extending far beyond poster margin of pronotum, reaching or not reaching the base of hind femora. Pronotum cylindrical, fore margin convex or weakly emarginate, hind margin slightly emarginated, lateral keels absent, median keel normal, low, slightly cut by three transverse sulci. Prozona about 2.0–3.5 times longer than metazona. Prosternal process conical, apex pointed or slightly pointed. Lateral lobes of mesosternum broader than long, mesosternal interspace squarish; metasternal lobes separated widely. Tegmina and wings absent. Upper keel of hind femur smooth, well proportioned, kneelobes rounded. External apical spine of hind tibia absent. First abdominal tergite with distinct or hardly perceptible tympanum. Tenth tergite with distinct

furculae and epiproct triangular with rounded apex in ♂. Cerci of male seen from above slightly s-shaped, seen in profile with thickened base and in ♀ conical with rounded apex. Ovipositor with 2 teeth on tip of valves.

Type species: *Eozubovskya koreana* (Mishchenko, 1952) Comb. nov.

Diagnosis

The new genus is similar to *Zubovskya* Dovnar-Zapolskii, 1933, but differs from the latter by first abdominal tergite with distinct or hardly perceptible tympanum in *Eozubovskya*.

Etymology

Eo- means original in Latin, because of the new genus *Eozubovskya* is considered more primitive than *Zubovskya* Dovnar-Zapolskii, 1933 by tympanum present.

UP to now, there are 5 species of the new genus:

1. *Eozubovskya banatica* (Kis, 1965) Comb. nov.

Zubovskya banatica Kis, 1965, *Reichenbachia*, 5: 5.

Distribution: Romania.

2. *Eozubovskya koreana* (Mishchenko, 1952) Comb. nov.

Zubovskya koreana Mishchenko, 1952, *Fauna of Russia*, Insects: Orthoptera, 4 (2): 352; Storozhenko, 1980, *Zoologicheskii Zh.*, 59(5): 786.

Distribution: North Korea.

3. *Eozubovskya mistshenkoi* (Storozhenko, 1980) Comb. nov.

Zubovskya mistshenkoi Storozhenko, 1980, *Zoologicheskii Zh.*, 59(5): 786.

Distribution: Russian SFSR.

4. *Eozubovskya planicaudata* (Zhang & Jin, 1985) Comb. nov.

Zubovskya planicaudata Zhang & Jin, 1985, *Contrib Shanghai Inst Entomol.*, 5: 209

Distribution: China.

5. *Eozubovskya weishanensis* (Zheng, Zhang & Ren, 1995) Comb. nov.

Zubovskya weishanensis Zheng, Zhang & Ren, 1995, *Acta Zootaxonomic Sinica*, 20(3): 351–353.

Distribution: China.

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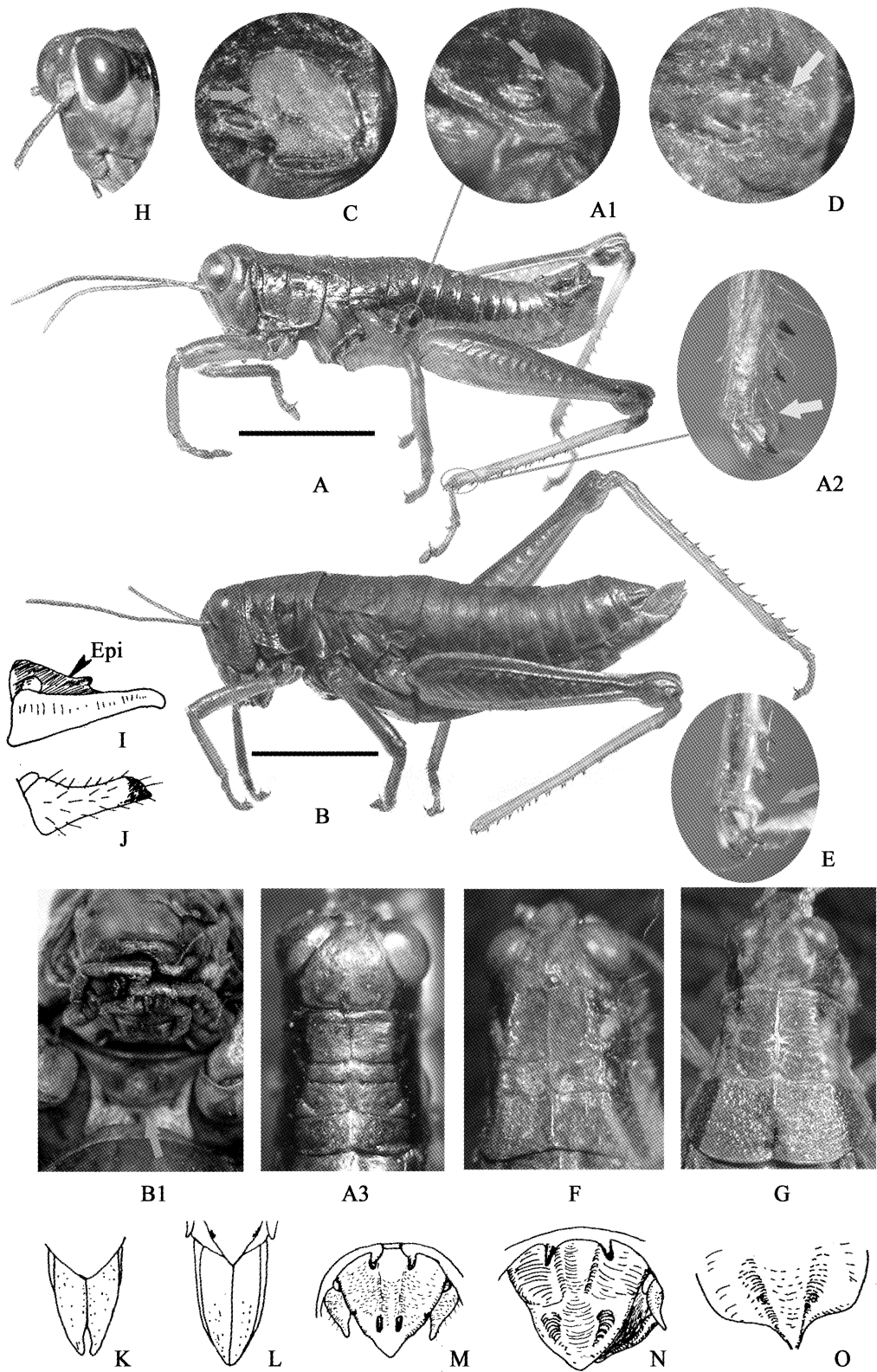
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Explanation of Plate I

A: *Eozubovskya planicaudata* ♂, lateral view; A1: Tympanum very small, hardly visible; A2: External apical spine absent; A3: Head and pronotum, dorsal view; B: *Eozubovskya planicaudata* ♀, lateral view; B1: Prosternum with elongate process; C: *Guizhouacris xiai* ♂, tympanum developed; D: *Conophyma almasyi* ♂, tympanum absent; E: *Conophyma almasyi* ♂, external apical spine present; F: *Kingdonella bicollina* ♂, head and pronotum; G: *Qinlingacris elaeodes* ♀, head and pronotum; H: *Rhinopodisma eminiifrons* ♀, head; I: *Micropodisma salamandra* ♂, cerci; J: *Pseudoprumna baldensis* ♂, cerci; K: *Micropodisma salamandra* ♀, ovipositor; L: *Pseudoprumna baldensis* ♀, ovipositor; M: *Cophopodisma pyrenaea* ♂, epiproct; N: *Italopodisma costai* ♂, epiproct; O: *Oropodisma parnassica* ♀, subgenital plate. The length of bars is 10 mm. I – O are from Harz, 1975.



Explanation at the end of the text

欧亚大陆裸蝗亚科的分类研究

(直翅目: 蝗亚目: 蝗总科)

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摘要: 本文对欧亚大陆裸蝗亚科(Conophyminae)进行了系统的分类研究, 将其分为 4 个族, 其中包括 3 个新族, 即贝氏蝗族(Bienkoini tribe nov.)、庚蝗族(Genimenini tribe nov.)和普乐氏蝗族(Plotnikovini tribe nov.), 记述了一新属——原无翅蝗属 *Eozubovskya* gen. nov., 并附已知 4 族 25 属的检索表。将该亚科中原有 3 个具翅的属(*Khayyamia* Koçak, 1981, *Conophymacris* Willemse, 1933 和 *Zagrosia* Descamps, 1967)移出, 归入秃蝗亚科(Podisminae)。

关键词: 直翅目; 裸蝗亚科; 分类; 新族; 新属; 欧亚大陆

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